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EDITORIAL

DUTIES ASSOCIATED WITH WAR

ALTHOUGH the Veterinary Profession is not largely in uniform at the present time, as was the case during the war of 1914-18, there are many directions in which its services are being employed. In the following pages are two examples: (a) The acquisition of knowledge concerning damage done by war gases and the remedies which can be applied not only to the live contaminated animal but also to foodstuffs, should they be exposed; (b) the purchasing of mules and their transportation from distant countries to parts of the world where they may be required in the war effort.

The Veterinary Profession has, of course, already applied itself to preparations for the tending of animals in the country which might be injured by enemy action, and the service has already functioned in many districts. Although the original National A.R.P. for Animals Committee has now been replaced by other organisations, the work of the Committee, and especially that carried out by veterinary surgeons in cities, urban districts and rural areas, must always be remembered. Due credit has been given to the efforts of the profession by many authorities, and though the name of the organisations have been changed and the details of the services have been amended, it is significant that the various ministries concerned are now intimately involved in the work to be undertaken. While, happily, it has not been necessary to adopt active measures for the alleviation of the effects of war gases, it is important that we, as a profession, should be fully acquainted with their nature, effects and methods of examination for their presence among stock and foodstuffs. The paper by Dr. Dowgiallo, published in this number, is yet another contribution to the subject which should

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assist veterinary surgeons in their apprehension of the problem to be tackled, should the necessity arise.

Horses, mules, etc., which played such an active part in the 1914-18 war, have been very largely dispensed with under more modern methods of warfare. We live in a mechanical age and war is waged accordingly. That equines still may have some part to play in certain circumstances is apparent. Many of us can remember the transference of horses, mules, etc., from the "New World" to the various theatres of war in 1914-18. The article by Capt. T. L. Wright, published in this number, recalls some of the experiences of 25 years ago and again portrays the various methods employed and difficulties which the veterinary surgeon has to meet when called upon to assist in the obtaining of the necessary animals and their transport over long distances under conditions of war.

The duties of the Veterinary Profession do not, however, end in tending the injured animals, being prepared to deal with gas-contaminated stock and feeding stuffs, and the examination and transport of horses and mules. Their essential duty in this war is to combat the diseases of our farm stocks in order that the maximum amount of food may be supplied from home sources to feed the population. We have pointed out on several occasions in the Journal the important functions which the Veterinary Profession has to fulfil, and have drawn attention to the necessity of all of us acquiring the newest knowledge of proved methods of disease control and their application. An adequate supply of milk and meat is essential to the war effort, and it is from home sources that much of the supply must be drawn. Our first duty in this war remains as it was at the beginning—to ensure, as far as the application of available knowledge is concerned, that diseases which limit such supplies will be reduced to a minimum.

General Articles

FOOD AND POISON GAS

By DR. JOSEPH DOWGIALLO

Introduction

POISON GAS can be used to attack the enemy not only directly to harass him, to render him helpless or to destroy him, but also indirectly to contaminate food. Contamination of food by poison gas depends on the type of gas used, the method of contamination, the duration of contamination and many other factors. After eating food contaminated by poison gas, minor or serious injuries and in some cases even death may result. No part of the body is immune from the effect of war gas. Contaminated food sometimes shows no visible changes either in the outer or in the deeper layers.

In dealing with gas contamination of food the following points have to be considered:

(1) Is the food really contaminated by gas?
(2) By what gas was it contaminated and degree of contamination?
(3) What is to be done with contaminated food?
(4) Is decontamination possible?
(5) What means is there of decontamination?
(6) How can food be protected from contamination and what are the methods of protection?
(7) What materials constitute the best means of protection and how should they be used?
(8) How should victims of food poisoning be treated?

Valuable food should not be destroyed without first ascertaining whether or not it is poisoned. When there is only suspicion of contamination, it should be examined with especial care. This is a task for the specialist, who must accept responsibility.

PART I

A.—TYPES OF GASES

In order to ascertain the possibility of gas poisoning, it is necessary to detect which particular type of gas has been used and how the gases affect particular types of foods, fodder or water.

Note.—"War Gas" means more or less known chemical substances which, when dispersed in the air even in very small quantities, may cause injury to the organism. They can be employed in many different forms, such as gas proper, vapour, clouds, liquid, and also in solid forms which sublimate as smoke gas.

During the last war there were about 80 different gases. It is unnecessary to discuss in detail each particular gas. The well-known poison gases can be classified into four groups, depending on their physiological actions, viz.: (1) tear and sneezing gases, (2) choking gases, (3) blister gases, and (4) gases with a so-called "common poisoning" action, as carbon monoxide (CO)

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and hydrocyanide (HCN); but the method of dividing the gases into four groups with regard to food contamination is slightly different.

The basis of division of poison gases with regard to their ability to poison food, is a knowledge of their physical and chemical properties. Principal among these factors is the non-persistency (volatility) or persistency of the gases, their viscosity, state of concentration, ability to hydrolise in a temperature which is not especially high, reaction to chemical elements, their toxical values and general toxicological properties.

Poison gases can, therefore, be divided into four basic groups.

Group I

These are non-persistent poison gases which are very volatile and hydrolise, e.g., they persist for several minutes to a few hours and their boiling points are usually low (below 0 deg. C. to 120 deg. C.—seldom more). The products are not dangerous. This group contains choking gases such a chlorine, phosgene, di-phosgene (not chloropicrin!), carbon monoxide, hydrogen cyanide (the latter two are common poison gases). All these gases disperse very quickly, therefore their time of persistence in the air is very short, usually not more than a few hours.

The possibility of food poisoning by gases in this group is slight.

Group II

These are non-persistent or partly persistent gases, the boiling point of which is about 60 deg. C. to 150 deg. C., seldom more, less volatile but unable to hydrolise. The time of persistence in air is two hours to two days, sometimes more. The residue after decontamination is not dangerous. There is only one choking gas in this group, i.e., chloropicrin. Tear gases and non-arsenical nose-irritant gases are also included.

Most of the gases in this group have low contamination ability.

Group III

This group is comprised of persistent gases, e.g., mustard gas.

Mustard gas boils at about 214 deg. C. and time of persistence is from two days to a fortnight, sometimes longer, especially in cold weather.

This gas has a fair ability to contaminate. It is very toxic and hydrolises very slowly. After destruction the residue is not dangerous.

Group IV

The gases in this group, i.e., lewisite and other arsenical gases, are persistent, and the products after destruction are also dangerous. Into this group fall also the compounds of heavy metals--lead, zinc, and phosphorous compounds, which are often used in combination with gases of this group.

B.—Food

Physical and Chemical Properties of Foods in relation to their susceptibility to contamination

The *physical structure* of the food has a large influence on the degree of contamination, such as rough or smooth and dry or wet surfaces. The degree of dispersal will also be different. A large and rough surface will absorb more poison gas than a small and even surface. For example, meal or sugar will

absorb the vapour of poison gas more than potatoes and fruits. This finding does not apply, however, when liquid poison gets to a rough surface when the food is sufficiently dry and loose—e.g., flour or meal.

Liquid gas falling on flour, etc., forms lumps on the surface which are highly poisonous but beneath this surface the flour will be uncontaminated. If, however, the flour is not immediately treated, a small amount of gas vapour will penetrate below the top surface.

Chemical Properties

Proteins have several characteristic properties which do not render them immune to poison gas. There is the "amphoteric" character of proteins, the colloidal character and the ability of surface absorption. Because in the case of proteins there is only surface adhesion, they are decontaminated more easily than fats.

Fats. A large number of poison gases are soluble in fats and thus the gas penetrates right through and the gas is not given off very readily. For example, poisoned fat gives off only about 12 per cent. of the poison by evaporation. Because all fats, e.g., olive oil, butter and bacon retain gases, they are very dangerous to consume. Usually decontamination is not possible.

Carbohydrates are rather indifferent to poison gases, which they absorb very readily, especially when the surface is dry and rough, but they are also decontaminated readily.

Mineral salts behave similarly to carbohydrates.

Water is the enemy of many poison gases, which it can absorb and hydrolise.

The water content of food constitutes a natural defence against poison gas. The greater the quantity of water in the food, the better the defence against deep penetration. The larger the surface of the food the greater the degree of dispersal of gas. There is also a larger surface for hydrolysis and consequently hydrolysis will take place more rapidly. The "self-defence" of food relies, therefore, upon the binding qualities of protein, which forms a natural bar, and upon the hydrolytic action of the water content.

An important factor which aids decontamination is the ability of poison gas to evaporate. The rate of evaporation depends upon the temperature, amount of air current and degree of absorption into the food. From fat, evaporation is very difficult, from protein it is easier. Particles of poison absorbed superficially by cellulose and starch will evaporate much more easily than from foodstuffs such as straw and hay. (*Note.*—When gas penetrates the skin and mucous membranes of the human or animal body it is much easier for the gas to penetrate a greasy or sweaty skin than a dry one.)

The presence of salt, other mineral compounds or weeds in water may cause more rapid decomposition of the poison by breaking it up. Heating can cause the poison to disappear by evaporation. Some poisons, especially solid compounds (Group IV) are dissolved in water or decompose but their poisonous elements still remain.

The *penetration* of gas into food depends not only on the type and quantity of gas used and on the physical and chemical composition of the food, but also on the bulk, method of storage, etc.—e.g., hay stored in a stack will absorb much more poison than hay in bales. If sacks of grain are stored so that there

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is free passage of air, the poison will penetrate easier than when packed closely.

During warm weather evaporation of liquid poison is quicker, particularly in the sun. Even so, the time of day can influence the evaporation of gases. Moisture in the air or rain has a great destructive effect on them. Wind accelerates evaporation. There is, therefore, less chance of contamination when the wind is blowing.

On open ground the gas will disperse very quickly and to a great distance. On ground with grass, trees and bushes, penetration will be heavier but limited. In the hills, gas will collect in pockets in the valleys.

Degrees and Signs of Contamination

The different degrees of contamination can be summarised as follows:

(1) A *very strong* degree of contamination will result after 24 to 48 hours (in closed buildings) when a gas bomb has exploded in the immediate vicinity leaving a pool of liquid or a heavy cloud of poison gas sprayed within a few feet of the ground.*

Signs of Contamination: Very strong smell; marks on the surface of the food caused by liquid (or powder) or heavy clouds.

(2) A *strong* degree of contamination occurs when a gas bomb, etc., explodes within a radius of about 20 to 50 yards, leaving splashes or heavy clouds, or when released from aircraft flying at a height of 600 to 1,200 feet.

Signs of Contamination: Quite a strong smell (or irritation) and sometimes splashes on surface of food or marks from powder.

(3) A *lesser* degree of contamination occurs when a gas bomb, etc., explodes within a radius of about 100 yards, or when sprayed by aircraft from a height of more than 1,200 feet and the wind is blowing in the direction of the food.

Signs of Contamination: Smell of poison and sometimes splashes.

(4) A *low* degree of contamination occurs when gas bombs explode within a radius of 100 yards and only clouds or vapour result, or when sprayed by aircraft from a height of more than 2,400 to 3,000 feet. There will be mostly low clouds or vapour.

Signs of Contamination: Very little smell, which disappears very quickly.

Such estimations of the different degrees of contamination can be very valuable. The degree of contamination largely depends upon the methods used to protect the food.

PART II

Methods of Recognising Contamination of Food by Poison Gas

The means of distinguishing are:

(1) By sensory organs (organoleptic).
(2) Chemical.
(3) Biological.

(1) "ORGANOLEPTIC" method of distinguishing each particular poison gas is by its smell, irritation, eyesight and taste. Each poison has its particular odour and every person has his own ideas of these smells, but the following is the generally accepted conception of the smells of different poison gases.

* A very strong degree of contamination can be found after a few days in closed buildings or other unventilated places, in calm weather or low temperatures, etc.

Chlorine has a very familiar smell as of bleaching powder and disinfectant. *Phosgene* and *Disphosgene* have a musty smell of hay or earth. *Chloropicrin* has a smell of musty pears or leaves. *Mustard gas* has a faint odour of onions or mustard. *Lewisite* has a strong odour of geraniums. *B.B.C.* (bromobenzylcyanide) smells of honey or bird-cherry. *D.A.* (diphenylchlorarsine) smells of violets. *H.C.N.* (hydrocyanide) has a smell of bitter almonds. Other poison gases smell sometimes of antiseptics or chemicals (sometimes called a "hospital smell"). Fortunately, there is usually a "strange" smell, which attracts one's attention.

Note.—In Russia special sections are detailed off to detect gas by smell.

Irritation. It is well known that all nose and tear gases cause strong irritation of the free sensory nerve endings of the mucous membranes. This assists not only detection of the presence of gas but also the type of gas used. The irritation caused by these gases is so strong that even a weak solution makes itself felt. For example, bromobenzylcyanide irritates the mucous membranes if used in the proportion of 1 : 25 millions of air when the action is only physiological.

Taste. Sometimes the presence of gas in food can be detected by taste. The food usually tastes "peculiar" and after contamination it is repulsive, even to animals. Even after decontamination a strange flavour may persist.

It is known that chlorine and other gases when mixed with water can cause an acid or salt taste, while after arsine contamination, etc., the taste will be bitter.

All unusual changes of taste in food should be regarded with suspicion, though the foods are not always dangerous. The objectionable smell may persist, however, even after decontamination. For example, water contaminated by mustard gas will smell of chlorides for a long time and is therefore impossible to use it for cooking, although it may not be dangerous to drink.

If cigarettes have been contaminated with phosgene or mustard gas they will be unpleasant to smoke. It is also interesting to note that if a person has been the victim of a gas attack by these gases he will have great aversion to smoking.

Eyesight. Sometimes contamination of food can be recognised by the naked eye. After heavy contamination there will be a strong smell and there is usually some kind of stain or mark. Characteristic lumps will be seen in flour contaminated by mustard gas. In such cases it is not only easy to detect the exact place of contamination but also the quantity of food contaminated. The stains or marks after contamination appear as brownish or rust-coloured marks. Trees and grass after contamination have the appearance of having been scorched by sun or even burned (especially pine trees and fir trees). Sometimes they will be straw-coloured, greenish-yellow (chlorine) or grey spotted, and afterwards they may wither and die.

(2) CHEMICAL MEANS. This is especially the work of a chemist, but the following notes may be of assistance:

Chemical means of detection are based on the chemical reaction and electrolisation, which enable easy detection of the type and quantity to be made. Such methods are usually accurate, especially with chemical groups of metals or metalloids. Sometimes, however, difficulties will arise in the detection of poison gases,

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especially when they have been absorbed by the enzymes of the cells (as with chloropicrin, etc.).

There are several ways of detecting poison gases. For the most part there are chemical reagents which show a colour change or leave a residue. The simplest methods of detection are by the use of papers impregnated with a (detector) reagent. More elaborate methods can, of course, be employed in the laboratory.

The reagents can be grouped for all gases collectively, or individually for each gas.

(3) BIOLOGICAL MEANS. This method of detecting contamination of food is based on the use of certain domestic animals which are more or less sensitive to particular poison gases. Some animals are specially sensitive to them. For example, birds will die in air contaminated by carbon monoxide in a percentage to which man does not react at all. Cats and horses are specially sensitive to mustard gas in the digestive organs—pigs to mustard gas, particularly on the skin and so on.

For biological work, birds, mice, rats, guinea-pigs, rabbits, cats, dogs, pigs, cows and horses can be used and human beings can aid in the detection of the contaminated material by noting the irritation when he smells the object.

Below are some of the methods for biological research on animals:

(*a*) Eyes. (*b*) Ears. (*c*) Skin. (*d*) Respiratory organs.
(*e*) Digestive tract.

(*a*) *Test by eyes.* The main object is to detect the presence in food of irritant gas, such as tear gas, chloropicrin, blister gas, etc. For this purpose white mice, rats or rabbits can be used. The method is as follows: The animal is put under a glass jar having a two-litre capacity together with a dish containing suspected food. If the animal is left for a long time, care must be taken to cover the jar containing the food and animal with porous material, otherwise the animal will suffocate. In the presence of a poison gas, such as irritant gas, in food, the animal will begin to react very quickly, depending on the degree of contamination. The symptoms of poisoning are restlessness, lacrymation, redness of the mucous membranes, shutting of nostrils, keener sight, sweating, lassitude and coma. With a greater quantity of poison, excitement and coma will follow more quickly. Sometimes the animal will jump into the water in the glass jar. The reaction is rapid, especially with B.B.C. and chloropicrin, etc. The smallest amount detected by this means is one part of gas to 25 millions of air. In the case of food contaminated by mustard gas, symptoms are shown after one to two hours, sometimes later. The reactions are very slow and consist of restlessness, irritation of mucous membranes, lassitude, sweating and coma.

(*b*) *Test by Ears.* This test is carried out on rabbits by dropping an extract of the poison on to the *ears.* The eyes may also be used when the quantity of the poison is small or contamination is only suspected. The test is as follows: A small quantity of suspected food is taken (grass, grain, etc.), mixed with petrol ether, put into a small tin with a lid and shaken carefully for twenty to thirty minutes. Anti-gas gloves must be worn. The mixture is then poured into a china dish and after further evaporation (on hot sand) the residue is put on the inside of the rabbit's ear. The second ear is used as a control. After twenty-four

hours, on comparing the ears, the presence of poison is detected by erythema or œdema in the treated ear. The next few days will show changes in the degree of irritation and sometimes there is ulceration or superficial or deep gangrene of the tissues. The latter seldom occurs in the ear. When the action of blister gas is slow, the comparison of the ears is essential.

(*c*) *Skin Test.* The pig, by reason of its white skin, reacts very quickly to blister gas. A small quantity of suspected food can be applied to the skin by adhesive plaster and left for twenty-four hours, when the skin changes can be observed.

(*d*) *Respiratory Organs Test.* For this work mice, rats and rabbits are used. The procedure is as follows: Put the mice (usually two) under the glass jar as before with the dish of suspected food. Fresh air must be accessible (wire netting may be used) so that the animal will not be asphyxiated. The following changes will be observed: After a short period of restlessness the animals become sleepy, the mucous membranes of the eyes are red, there is loss of appetite and the sight is keener. Post-mortem examination shows changes in the lungs and other organs, depending on the type of gas used.

(*e*) *Test by Feeding Animals with Contaminated Food.* Pigeons are given contaminated peas. Very little blister gas (about 0.2 gms.) can cause their death within twenty-four hours. The digestive organs show definite signs of an irritant poison—hæmorrhagic inflammation of the stomach and intestines. Feeding tests can also be carried out on cats, which are very sensitive, especially to mustard gas. Dogs also may be used. Meat suspected of contamination can be given to these animals. Rabbits, mice and rats can be used for tests on grain and plants. Likewise cows and horses also react to contaminated food, but to use them for test purposes would be too expensive and they are only used in the case of large and valuable fields of growing grain, pasture land, etc. They are left for several hours on the contaminated area, their reactions are observed and post-mortem examinations are made.

(*To be continued*)

THE ACQUISITION OF MULES IN SOUTH AMERICA AND THEIR TRANSPORTATION TO INDIA

By CAPT. T. L. WRIGHT, M.R.C.V.S.

Putney

EARLY in 1941 I was asked if I would go, at very short notice, to a neutral country with a purchasing officer to buy mules for India. I gladly accepted the offer and had seven days to make my plans.

As practice in London had become greatly reduced, I asked a neighbouring colleague, Mr. J. O'Mahony, M.R.C.V.S., of Battersea, if he would undertake to run my practice for me during my absence, in conjunction with his own. This he did, most loyally.

Next, the question of kit and baggage had to be dealt with, bearing in mind that one had to undertake a sea voyage over the North Atlantic in winter, followed by a sojourn of uncertain length in South America in a fairly hot climate. It was desirable to keep the baggage to the smallest compatible with

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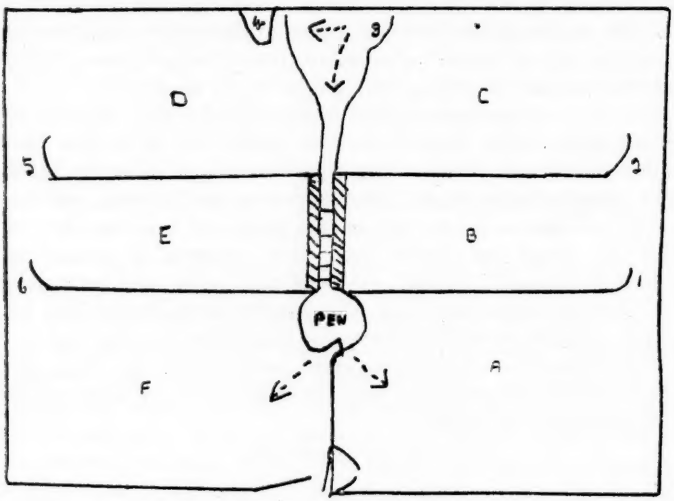
comfort and a respectable appearance (i) for convenience of transit (ii) because one *might* have to abandon it all at sea! Therefore, having interviewed the head of the Department from which I received my instructions, and the purchasing officer whom I had to accompany, I started off with a small cabin trunk and a suitcase for a Scottish port, from which we sailed in very cold weather and travelled by a northerly route to a Canadian port, thence by train to Montreal, where we spent an afternoon, and on by night train to New York. From there we went by aeroplane to Buenos Aires—4½ days, flying by day and resting at night, spending a night each at Miami, Florida; San Juan, Porto Rico; Belem (Para), North Brazil; and Rio de Janeiro, reaching Buenos Aires on a hot afternoon. We remained in Buenos Aires for a week, reporting at the Embassy, interviewing the contractor who had undertaken to supply a certain number of mules by a certain date at a fixed price per head, and awaiting news



of the arrival of the first batch of mules for our inspection at the collecting centre. We arrived at the latter, after an all-night train journey, in time for breakfast, and immediately afterwards started work on what we found to be an estancia of about four square miles with very good corrals and an excellent "race" for putting the mules through for inspection, ageing and measuring (see diagram).

Mules to be inspected were assembled in enclosure A, which would hold up to 250 small mules (12 hands 3 inches to 13 hands 3 inches). The purchasing officer and I stood in enclosure B and mules were ushered in, two at a time, through gate 1, with gate 2 closed. Here we were able to get a fair idea of approximate height, conformation, and action, and to detect any obvious unsoundness. We had to select two types—12 hands 3 inches to 13 hands 3 inches, and 14 hands 1 inch to 14 hands 3 inches, of a stocky type suitable for heavy packs. These we referred to for convenience respectively as "small" and "large." So, on this preliminary inspection we immediately rejected any animal which was obviously not within the limits of height requirements, or with undesirable con-

formation, or obvious unsoundness, such as blindness, lameness, club-foot, hernia, spavin or serious injury—or anything to which we took exception. There was no possibility of handling them at this stage, as they were practically all unbroken, and if we noticed some abnormality which might not pass examination on closer inspection, we made a note to pay attention to that at a later stage. Having decided and agreed that one, or both, or neither of the two merited closer examination, our decision was announced. If both were good, they were marshalled through gate 2, across enclosure C, through gate 3 into the small compound which "funnelled" into the race, through which they passed to enclosure F. If one was good and the other rejected, an attempt was made to separate them at gate 2, failing which they went together into enclosure C and were split up before passing gate 3, so that the "good" one took the route just described into enclosure F, and the reject was directed through gate 4 into enclosure D. Thus, in time, all the rejects were collected in D, and all the probables in F.

Then we had an "inquest," going through each of these two enclosures to see if there might be anything which called for a change of opinion. This change was rarely necessary, though sometimes it was apparent that a mule had slipped through into the wrong enclosure. Now the final selection had to be made, based on age, measurement, and closer scrutiny. All mules in F were driven into A and marshalled in batches of about twenty through gates 1, 2 and 3, into the compound leading to the race. Six at a time were driven into the race, which had seven strong sliding wooden gates, so that each mule was enclosed in a separate compartment. There was a strong wooden platform about 3 feet high running alongside the full length of the race on one side, and the length of the first compartment on the other side. On this, one could walk along and look down on the mules in the race and get a good view of head, neck and back, and, by leaning over, get a fair impression of limbs and feet. Each of the six, in turn, was then secured by the head by peons, either with a rawhide halter or by holding by the ears, and the mouth was then examined for ageing and general soundness and health, and the eyes were inspected—in short, one did all that was possible then which was not practicable in the preliminary survey. As each mule was passed as of suitable age and serviceability, this was announced, and it was then measured by cautiously passing a measuring standard down inside the compartment and manipulating it from the platform. The processes of ageing and measuring were quite often strenuous, and trying to one's patience. Those who are accustomed to them know that some of these untamed mules can be really vicious and determined in their efforts to bite. I was frequently warned by some of the old hands that it is very easy to get a finger bitten off, but by good luck or good management I escaped anything more serious than a few abrasions—which more often came from the woodwork than the mule's teeth.

Fig. 1 shows the race with mules shut in ready for examination.

Figs. 2 and 3 show work in the race.

Measurement was the last act in the examination. An announcement was made as to which of the six had been accepted and which rejected, and those accepted were branded with the official brand. Fig. 2 shows branding in progress when it had been raining and steam is rising from the wet hair.

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After branding we made sure that enclosure A was empty; the mules were released one by one from the race into the small wired pen in front of it. This had a two-way triangular gate which was manipulated so that the accepted mules were directed into A and the rejects into F. Thus the batches of six were dealt with until the whole consignment had been through. The accepted animals were retained. Sometimes the rejects were taken away immediately, at other times they had to remain for a while, and were always put several paddocks away from the accepted to lessen the chance of breaking through the wire and getting mixed again.

Not all the mules which we had to inspect were sent to us at the collecting centre. We had to make several long journeys in various directions, 12-14 hours by train and then 12-45 miles by car over rough tracks. We generally travelled by night and found the sleeping-cabins comfortably equipped, though on some parts the railway lines were bumpy and the braking system rather rough, so that one had a considerable shaking at some of the halts. At one period I spent ten nights out of fourteen in a night train for 300-400 miles each night. Sometimes we had to spend the night at the estancia where we had been inspecting, sometimes at a hotel near the railway station. This largely depended on the train service. Some of the places only had two trains a week. We experienced an extraordinary variety of accommodation, both in style and price, but I shall always remember that one of the best night's sleep I ever had was in a very small town where the hotel had only four bedrooms, and the cost of bed and breakfast was the equivalent of about two shillings!

At the various estancias which we visited, very few had such excellent facilities (generally spoken of as "installations") as our collecting centre. In fact, some had nothing but a large corral enclosed by wire, which some of the mules broke or jumped and had to be rounded up again, causing considerable delay. Some had unsuitable races (built for cattle) in which many of the refractory mules fell and got cast, or managed to break or jump out and confuse the sorting which had already taken place. Where there were no installations, each mule to be examined had to be lassoed and thrown or secured to a post for close inspection, ageing, measuring, and—if accepted—branding.

At one place we started at 2.30 p.m. with 101 mules and 12 mounted men in a large corral, like a huge saucer of deep sand about 200 yards in diameter. As we spotted a likely mule he was pointed out, and, after varying degrees of chasing the whole herd by the mounted men, the required animal was roped and thrown, examined and branded if accepted, or released and chased out of the corral if rejected. We worked without a break until 7.30 p.m., having collected a "bag" of fourteen by the end of a hot, dusty, tiring day—the sun setting with clouds behind the scrubby growth on a sandy ridge just outside the corral. We were fifteen miles from the railway station, and there would be no train until the next afternoon. We stayed the night in a "guest-room," which was a corrugated iron lean-to, built beside the house. The chief meat in this region is goat. The land is too poor to raise cattle. As a special "honour" we were given milk-fed kid for lunch. We failed to classify it as a delicacy, but perhaps that was because it was brought in and slaughtered at 10 a.m., hung on a hook till 11 a.m., when it was roasted on iron bars over open wood-embers, and was on

FIG. 1.—Mules shut in race ready for inspection.

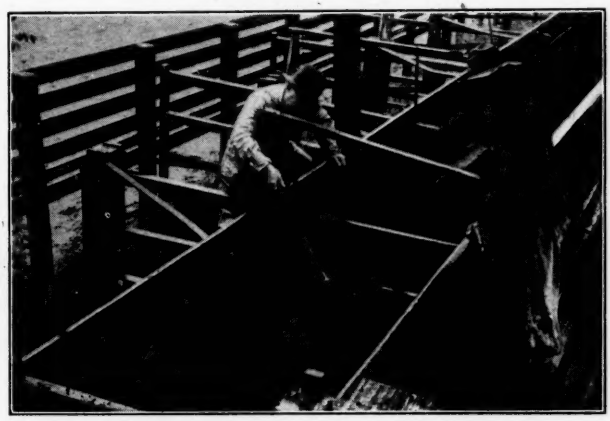

FIG. 2.—At work on mules in the race.

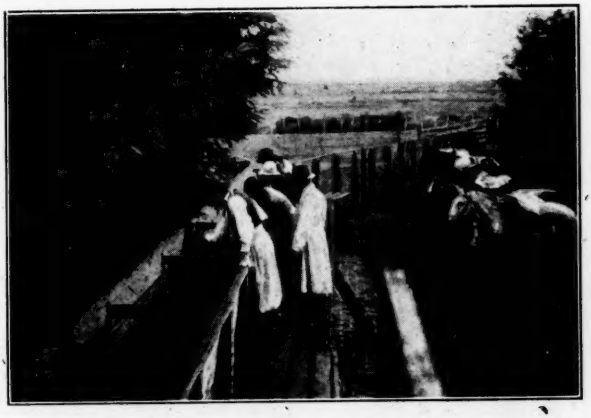

FIG. 3.—At work on mules in the race.

FIG. 4.—Mules (14 h. 1—14 h. 3) in corral after two days' heavy rain.

FIG. 5.—Mule just lassoed, being branded.

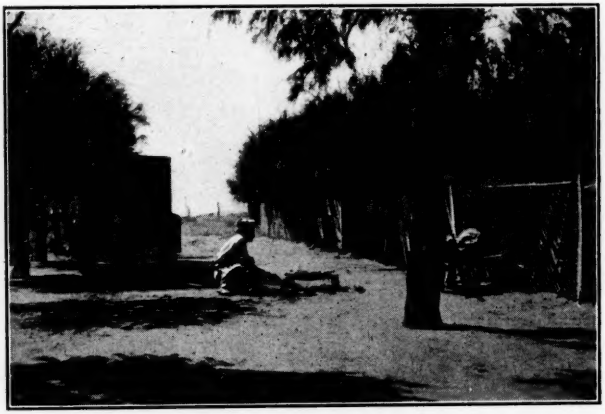

FIG. 6.—The kid being cooked for our lunch.

the table at noon. (Fig. 6 shows the cooking in progress.) Thus, briefly, we collected 2,000 mules, the small, cheaper specimens coming mainly from the sandy plains and rocky sierras, where it pays to breed them because the land is rough and of low fertility and unprofitable for cultivation or rearing of cattle and horses, and therefore very cheap. The larger and much more expensive mules came from the big fertile estancias where breeding of high-class mixed stock was carried out, and many of these big mules were out of high-class Clydesdale and Percheron mares. They could not be produced on the cheap rough land. From the outlying places where they were purchased, many batches of these mules had long journeys to the collecting centre. Some came on foot, being "trooped" in a herd of from 30 to 150, controlled by three or four mounted men and travelling 25-30 miles a day. Others came by rail, taking two or three days, but they have to break the journey each day to be unloaded, fed, watered and rested, and reloaded.

Those which had come a long way were generally given a few days' rest before official inspection and selection. (The expression used out there is always "revising"; one does not inspect or examine a flock or herd—one "revises" it.) As our collection grew, we had to keep a careful watch for disease, injury, and any signs of loss of condition. In June, July and August there was a drought and keep became very sparse. As spring approached there were sharp frosts (i.e., September in Argentina) and prospective new growth was checked, so a large number of our mules had to be sent about 20 miles away to a place which had not been grazed much that year. In the autumn we had seen outbreaks of contagious equine meningitis among working horses on the estancias, but these had all been promptly checked by vaccination of the whole studs. The question arose as to whether our mules ought to be inoculated, but on making careful inquiries from experienced people the general opinion was that mules *could* get meningitis, but not one of the people whom I questioned had even seen one affected. This suggested that mules must be at least very resistant to the disease, and it was decided not to vaccinate unless symptoms appeared. None of the mules under our observation ever showed symptoms of meningitis or encephalo myelitis, although in the winter some had a staggering gait and loss of condition which we were assured was due to eating frosted grass, and in the spring some showed similar symptoms, said to be due to eating poisonous fungi, and all the cases, with one exception, returned to normal, with no treatment beyond a change of paddock. The one exception was still tottering about when I left in October, but was expected to recover.

The accepted mules, in addition to being branded at the time of acceptance, were numbered on the hoof and a descriptive roll kept, showing colour, sex, age, height and distinctive markings. The time at which the numbering and entering on the roll were carried out depended on the size of the batch to be "revised" and the rate at which we could pass them through the race. Sometimes they were done at the time of branding, but, in the case of a large consignment, they were put in a separate paddock after branding, and brought in again at a later date for hoof-numbering and description, as the hoof numbering is a somewhat tedious process and greatly slows up the rate of acceptance if done at the time of branding.

(*To be continued*)

THEOBROMINE POISONING IN THE DOG

By G. W. CLOUGH

THIRTY years ago cacao shell was recommended as suitable food for milking cows and other livestock (*Annales de la Science Agronomique*, 1912, *29*, 321). The employment of this industrial residue as fodder caused damage to horses in Germany and Denmark; it was reported that in the latter country the feeding of two or three pounds of cacao shell per day to cows resulted in a diminished milk yield (*Deut. Landw. Presse*, 1915, June 9; *Journ. of Board of Agric.*, 1916, 498). Marchadier and Goujon recorded a case in which horses were poisoned by cacao shell in France; they pointed out that the toxic principle, theobromine, in the husk is variable in amount (*Journ. de Pharmacie et de Chimie*, 1919, *20*, 209). In a communication to the *Journal of the Ministry of Agriculture* (1925, 558) it was stated that horses may be fed up to 1¼ pounds and cows up to six pounds of cacao shell meal per day. Interest in the use of shell as fodder was revived when Knapp and Coward found that it contained vitamin D. Golding and Burr described the results of feeding two pounds of cacao shell per cow per day to dairy cows for a period of twelve months; the animals remained in good health, their milk yield was normal and the percentage of fat in the milk was increased (*Agricultural Progress*, *14*, 44). These results were confirmed by Knapp and Churchman, who stated that their tests clearly established the fact that cacao shell (containing one per cent. of theobromine) can be safely used as an accessory fodder for cattle when it is fed at a level of not more than two pounds per day. (*Chemistry and Industry*, 1937, *56*, 29).

The large surplus of cacao beans since 1939 has apparently led to the incorporation of cacao bean cake or extracted cacao bean meal in some animal foods. Woodman and Evans fed half a pound of extracted cacao bean meal daily to a sheep, but the animal suddenly died after a week of such feeding. "When more than small amounts of these by-products are fed to live stock, the theobromine tends to accumulate in the body, since the rate of its intake exceeds that of its elimination and when a certain level of storage is reached, the symptoms of toxicity become apparent with alarming suddenness" (Woodman, *Agriculture*, 1941, *48*, 45). Fatalities amongst farm animals which have received food containing cacao by-products have recently occurred in this country.

In the present communication attention is directed to the sudden deaths of several dogs in different localities; it was ascertained that the animals had all been fed with the same proprietary food, which was found to contain theobromine. Two sheepdogs were fed with the food in the evening of one day and again in the morning and evening of the following day; they exhibited some diarrhœa but were otherwise in good health. They appeared to be quite healthy on the next morning; one of the dogs was sent to round-up cows and after running some distance it collapsed and died immediately. The other dog, after running to round-up sheep, howled, collapsed and died. The food contained a cacao by-product, theobromine being present to the extent of 15 grains per pound. In a similar case three apparently healthy dogs dropped dead; they had been fed with the same proprietary food, which was found to contain 13 grains of theobromine per pound.

An elkhound was fed in the evening with the same dog-food and in the

early hours of the following morning exhibited sickness, diarrhœa and thirst. A few hours later it suddenly gave a cry and dropped dead. The food contained 15 grains of theobromine per pound. The conclusion was drawn that the deaths of these dogs were due to the action of theobromine on the heart. The incorporation of cacao products in the proprietary food in question has now been discontinued.

LEG WEAKNESS IN YOUNG CHICKENS

By F. D. ASPLIN

Weybridge

Leg weakness in young chickens reared in wire floor battery brooders is not uncommon. The symptoms make their appearance between the third to the sixth week of life. The chicks show a tendency to rest and even walk with their hocks on the wire. Their toes are curled inwards. Feathering is delayed and the chicks have a rather rough, unkempt appearance. Growth rate is often poor. As many as 50 per cent. of the hatch may show symptoms. Mortality is low. Death, when it occurs, usually results from trampling or smothering. Although growth rate may be poor for some weeks, spontaneous and complete recovery is the normal outcome.

The condition may occur in chicks brooded on solid floors, but the incidence is seldom high.

Various explanations have been put forward to explain the nature of the disturbance. It is held by some that the rapid growth which takes place in battery reared chicks causes them to " outgrow their strength " and thus become weak on their legs; also, that insufficient head room, preventing the birds from standing normally, results in forcing them to sink to their hocks. Sometimes the condition is attributed to the type and nature of the flooring.

None of these represents a satisfactory explanation. It is more probable that a nutritional deficiency exists. The course and symptoms are suggestive of riboflavin deficiency.

An attempt was made to obtain experimental cases of riboflavin deficiency in chicks brooded in a solid-floor brooder. Of 20 newly hatched R.I.R. chicks, fed a ration similar to that used by Bethke, Record and Wilder (1937), only one had developed typical leg weakness when the group was discarded at eight weeks of age.

When 12 similar chicks were reared in the same type of brooder, but to which a wire floor had been adapted, seven developed curled-toe paralysis.

It seemed probable that chicks reared on a wire floor were unable to make good a deficiency which existed in the food, whilst those on the solid floor obtained the required factor from some source other than the food. It is well known that many bacterial organisms are capable of synthesizing riboflavin. The possibility that certain organisms present in the chick's intestinal tract and in their fæces were able to synthesize riboflavin was considered. It appeared that if any synthesis of riboflavin took place it was only available to the chick when reingested.

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Whilst this work was in progress Lamoreux and Schumacher (1940) published an account of their observations on the synthesis of riboflavin in the fæces of the fowl. These workers demonstrated that the fæces of laying hens contained no more riboflavin at the time of defæcation than was present in the feed from which they were produced. When the fæces were held at room temperature the riboflavin content increased rapidly, so that a 300 per cent. increase was achieved in a week. Schumacher and Heuser (1941) isolated an organism, having the characters of the genus Bacillus, which appears to be responsible for the bulk of the riboflavin synthesis.

Experimental

Owing to difficulty in obtaining some of the ingredients of the diet previously fed, modifications in the mash were made.

Lean beef was minced and extracted with water at pH 6.4; after washing, the reaction was checked to pH 8.8 and the meat was autoclaved for 30 minutes at 20 lb. pressure. The meat was then spread on trays, dried and ground, and included in the chick mash. The mash was composed of meat 8 parts, earth nut meal 12 parts, middlings 35 parts, bran 7 parts, mixture of equal parts of $CaCo_3$, $Ca_3(Po_4)_2$, NaCl, 2 parts, cod-liver oil 1 part.

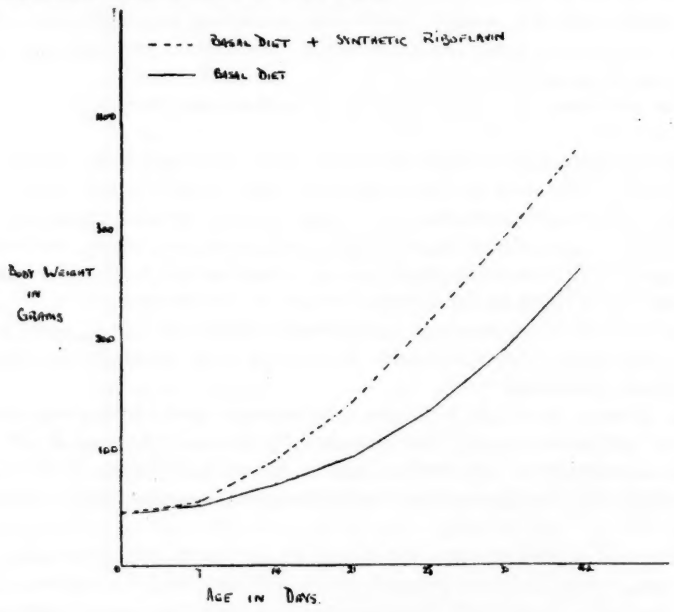

Fig. 1

Newly hatched R.I.R. were transferred direct from the incubator to indoor wire-floored brooders. Group I consisted of 12 chicks, which received the above diet without supplement. Group II consisted of 12 chicks, which, in addition, received 25 microgram doses of synthetic riboflavin for the first three days and 50 micrograms daily thereafter. The weights of the chicks recorded at the time of hatching and at weekly intervals are shown in Fig. 1.

The chicks of Group I all grew slowly. Feathering was delayed and nine developed leg weakness. Six were killed and on post-mortem examination all showed gross and microscopic lesions of riboflavin deficiency.

All chicks in Group II grew well and remained healthy.

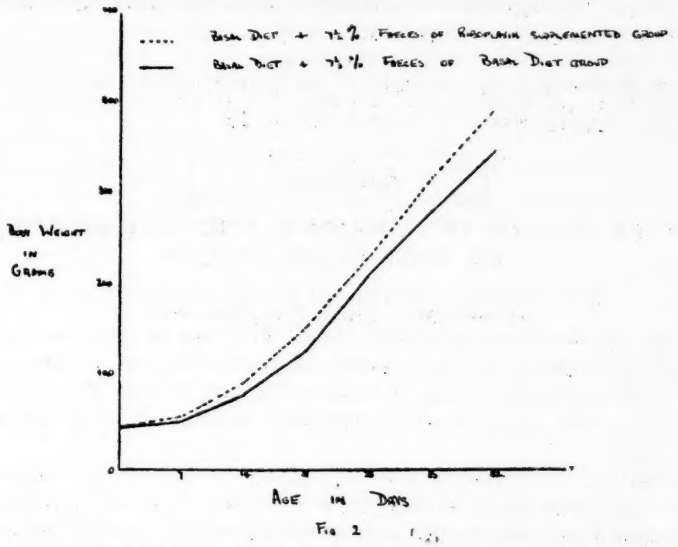

Fig. 2

The excreta of both groups was collected twice a week, spread out on paper and left at room temperature until dry. After grinding to a fine consistency it was incorporated in the riboflavin-deficient mash in the ratio 7½ parts by weight dried fæces to 92½ parts mash.

Group III consisted of 12 chicks which received mash containing ground fæces of Group I (i.e., riboflavin-deficient chicks). Group IV also consisted of 12 chicks, which received mash containing fæces of riboflavin supplemented, Group II chicks. The average weight increase of these groups is shown in Fig. 2.

The growth and general condition of all chickens fed fæces was better than that of the deficient chicks. No cases of leg weakness occurred. Chicks receiving the fæces of the riboflavin supplemented group were more active, feathered, and grew better than those receiving the fæces of the riboflavin-deficient group.

Discussion

The riboflavin content of the basal mash was not determined. That it contained insufficient riboflavin for normal growth and development of young chickens is indicated by the marked improvement which accompanied the administration of a supplement of synthetic riboflavin. The quantity of riboflavin used to supplement the deficient ration was not sufficient to produce maximum growth, since the growth rate of chicks receiving fæces of the supplemental group was better than that of the supplemented group.

The improvement in the efficiency of utilisation of the food and the preven-

tion of leg weakness which occurred when excreta was added indicates that riboflavin was being supplied.

These observations seem to give a satisfactory explanation for the higher incidence of leg weakness in battery-reared chicks than in those reared under other systems. The importance of including in chick diets foods rich in riboflavin, particularly when battery brooders are used, is obvious.

REFERENCES

Bethke, R. M., Record, P. R., and Wilder, O. H. M. (1937): *Poultry Sci., 16,* 175.
Lamoreux, W. F., and Schumacher, A. E. (1940): *Ibid, 19,* 418.
Schumacher, A. E., and Heuser, G. F. (1941); *Ibid, 20, 272.*

Abstracts

NOTE ON THE OCCURRENCE AND INHERITANCE OF PIGMENTED WOOL*

By R. B. KELLEY, D.V.Sc., and H. E. B. SHAW, B.V.Sc.
McMaster Field Station, New South Wales

Wool has many uses as a textile fibre. For some of these the material is dyed with dark colours, for others pastel shades are used, and for still others the fibre is made up without dyeing. For all but the first of these, the wool must be homogeneous with regard to colour; dark fibres in otherwise white fleeces are a disadvantage.

Perusal of the literature and descriptions of native types suggest that originally all sheep fleeces were pigmented and that sheep now carrying white wool resulted from domestication and controlled breeding. This conception would explain the observed occurrence of pigmented and parti-pigmented sheep among selected wool-bearing flocks. The absence of pigment could be the effect of what are known genetically as inhibiting factors, while the pattern caused by discrete areas of pigmented and white wool appearing on the same sheep probably would result from the action of a series of restricting factors.

When a sheep obviously is wholly or partly pigmented, its fleece can be isolated. However, when only a few black or brown fibres arise from small pigmented areas on an otherwise white skin bearing a white fleece the economic disadvantages are greatest.

Among well-bred, selected station flocks the occurrence of obviously pigmented sheep fortunately is relatively infrequent. A series of questionnaires was sent to co-operating pastoralists who answered them after two consecutive lamb-markings. By this means it was learnt that among the progeny of some 12,000 ewes only 0.04 per cent. were described by the pastoralists as coloured or pigmented.

Information with regard to pigmented spots bearing black or brown wool fibres was secured by examining a number of sheep immediately after they had been shorn. To discover such spots extreme care must be used, because frequently they are very small and give rise to very few dark-coloured fibres.

Their occurrence varied from zero to 74 per cent. They were not found in young Merinos of most strains, but were discovered in some particular strains. They were most common in old sheep, and were found in 1.3 to 12.0 per cent. of all five and six-year-old ewes examined. Over five per cent. of 3,000 ewes

* Abstracted from the *Journal of the Council for Scientific and Industrial Research,* Vol. 15, No. 1, February, 1942.

of all ages had such spots, and no age group was exempt. Results obtained from the examination of six ewe groups are given in Table I.

The association established with advanced ages and particular strains provides guidance alike for wool buyers and sheep breeders. If buyers require white wool that is unlikely to be contaminated with pigmented fibres, they should confine their purchases to fleeces from young sheep of known strains.

Sheep breeders wishing to avoid discrimination against their clips for this reason should discard old breeding ewes and breed only from strains in which the condition does not occur.

A series of matings has been carried out which shows that "pigmentation" is a recessive character. For the purpose, a pigmented sheep was defined as one that had an obviously large area of pigmented wool. A white-wooled sheep had no obviously large patch of pigmented wool.

TABLE I

The Occurrence of Pigmented Spots on the Skin of Ewes According to Age

Age	Number Examined	Average per cent. Occurrence
Under 1 year	700	0.5
1-2 years	416	1.2
2-3 years	500	2.2
3-4 years	342	3.5
4-5 years	348	6.3
5-6 years	275	7.2
6-7 years	216	15.7
7-8 years	213	15.0
Over 8 years	119	30.1
Mixed ages	50	2.0
Totals ...	3,179	5.6

When pigmented sheep were mated together they gave 25 lambs. Twenty of these were pigmented, whereas five were white. Large numbers of white-wooled sheep have given white-wooled progeny. White-wooled mated with pigmented reciprocally gave 73 lambs and 30 lambs, respectively. All of these were white-wooled.

The back cross also was reciprocal, but there were few cross (pigmented x white) females. First cross rams with pigmented ewes gave 79 lambs, 34 white and 45 pigmented. The reciprocal mating gave four lambs, three being white and one pigmented. The aggregate of the series was 83 lambs, 37 of which were white and 46 pigmented. The difference between this and 50 per cent. of each has no statistical significance.

The ratios of occurrence to non-occurrence in the first and back crosses indicate that probably only a single pair of genetic factors control the condition as defined.

This genitical analysis agrees with the conception stated earlier. It also explains why it is not an uncommon practice to use for breeding purposes,

without obvious disadvantage, superior animals having areas of pigmented skin which carry pigmented wool fibres. Usually in these cases the size of the spot alone determines whether or not such animals will be excluded from breeding.

Provided the pigmented animal is mated with a suitably bred white-wooled sheep, the progeny will be white-wooled. However, if these progeny or similarly bred animals are mated, some of their offspring are bound to show pigmented fibres.

Incidental to these observations, certain hypotheses have been put forward, e.g., those already stated with regard to inhibiting and restricting factors. Another hypothesis based upon the wide range of characterisation, suggests that a very large number of factor pairs are responsible for the pattern of the pigmentation. Possibly this will be found to have a normal distribution with wholly white and wholly black on the extremes of the range with all other types intermediate.

Further genetic investigation of these hypotheses would require a very large flock of sheep all pedigreed with regard to occurrence and distribution of pigment among their ancestors, and this is beyond our resources at this time.

A NOTE ON THE POSSIBLE ANTHELMINTIC VALUE FOR SHEEP OF PHENOTHIAZINE INCORPORATED IN FEED OR LICK*

By H. McL. GORDON, B.V.Sc.
F. D. McMaster Animal Health Laboratory, Sydney

PHENOTHIAZINE has a high anthelmintic value against a number of the important worm parasites of sheep, it prevents the development of larvæ in the fæces of treated sheep, and it has a relatively low toxicity for sheep. An investigation of the effects of phenothiazine when taken by sheep in small repeated doses with supplementary food or lick, therefore, seemed to be justified.

The investigation is not yet completed, but the many enquiries that have been received concerning the possibility of administering phenothiazine in salt licks or feed make desirable a brief record of the results already obtained in this laboratory.

Preliminary experiments showed that daily doses for five days of 1 g. or 2 g. phenothiazine to weaners and adult sheep in pens were effective against *Hæmonchus contortus* and *Oesophagostomum columbianum*, but not against *Trichostrongylus* spp.

The mean daily intake of 0.4 g. to 1.4 g. of phenothiazine in a food supplement by weaners in pens during a period of fifteen days, caused fairly good reduction in the number of *H. contortus* developing from larvæ administered concurrently, but a similar effect was not obtained when *Oe. columbianum* larvæ were administered.

When sheep consumed adequate amounts of lick (sheep in pens) or food supplement (field trial) containing phenothiazine the anthelmintic effect against *H. contortus* and *Oe. columbianum* was satisfactory. However, the amount of

* Abstracted from the *Journal of the Council for Scientific and Industrial Research*, Vol. 15, No. 1, February, 1942.

phenothiazine ingested in this way exerted but slight anthelmintic effect against *Trichostrongylus* spp.

Several of the sheep irregularly ingested only small quantities of the licks or foods containing phenothiazine. In these cases there was temporary but great reduction in the number of larvæ developing as well as reduction in the number of eggs in the fæces, but no apparent reduction in the number of worms present in the gut. These results would temporarily reduce contamination of the pastures, but give no relief of the parasitism of the sheep.

In a field trial, 90 per cent. of 36 sheep consumed sufficient of a food supplement containing phenothiazine to give satisfactory efficiency against *H. contortus;* 80 per cent. of them consumed sufficient to give a satisfactory effect against *Oe. columbianum;* only 25 per cent. consumed enough for satisfactory efficiency against *Trichostrongylus* spp. The total quantity of phenothiazine consumed was equivalent to two-thirds of one full dose per sheep during one period of six days, and a little more than one full dose per sheep during a second period of six days. Some individuals consumed considerably more than their share, and others thus obtained correspondingly less of the drug. If the same quantity of phenothiazine had been administered to the sheep in a single dose as a drench its anthelmintic effect would certainly have been greater. Moreover, drenching would have ensured a proper dose for each sheep, and a more uniform anthelmintic effect, including action against *Trichostrongylus* spp.

Therefore, although further work is required and will be undertaken, the administration of phenothiazine in salt licks or in a food supplement cannot be recommended at present, and the reasons may be summarised as follows:

(1) The amounts of lick or supplement consumed by the sheep are irregular and the anthelmintic effect varies accordingly.

(2) A full dose of phenothiazine consumed gradually in lick or feed over a period of several days has little effect on *Trichostrongylus* spp.

(3) To use phenothiazine in these ways is uneconomical, because better results can be obtained by administering the same quantity of the drug in a single dose as a drench.

Reports from the United States of America indicate that continued use of phenothiazine in salt licks resulted in serious discoloration of the fleece, which could not be removed by scouring. This has not been our experience in Australia, but further observations are needed.

Correspondence

WHITE'S "TREATISE OF VETERINARY MEDICINE"

To the Editor of THE VETERINARY JOURNAL.

Sir,—My reaction after recently perusing the "Early History of Veterinary Literature," is that Sir Frederick Smith has in some cases rather over-emphasised the shortcomings of the early writers whom he discusses in his history, and failed to give full credit for their greatness.

When one considers that these authors were groping in the dark,

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endeavouring to bring light to bear on the mysteries of anatomy, physiology and the nature of disease; that they had little in the way of earlier investigation and description to guide them, one is forced to the conclusion that they were truly remarkable men and worthy of remembrance for their successes and their influence on our present-day knowledge. It was inevitable that mistakes should have been made, but we at this time can afford to ignore them.

I happen to have one volume by White, written within the period described by Sir Frederick, the existence of which the latter appears to have been unaware. I gain my good impression of White as a result of a reading of this quaint book, and one hundred and thirty-three years after its publication I find that White is worth reading not only from the point of view of general interest and curiosity, but for the value of the information given.

My volume is a small book, the size of the pages of which measure four inches by six and one-half inches, and consisting of four hundred and nine pages plus index, and sixteen plates, some of which are in colour. The binding of the corners and back is in leather. The latter is embossed in gold, with the cover title "White's Farriery."

In addition, the back is embossed with symbols from above downwards, as follows: A vase of flowers; the title; two St. George crosses on stars, one beneath the other, and inclined to the left; the figure 1 in a twisted circle indicating Vol. I) and a vase of flowers.

The title pages give the title of the book as "A Treatise on Veterinary Medicine" (blocks).—Containing a Compendium of the Veterinary Art, or an Accurate Description of the Diseases of the Horse and their Mode of Treatment; The Anatomy and Physiology of the Foot, and the Principles and Practice of Shoeing—Illustrated by Plates—with observations on Stable Management, Feeding, Exercise and Condition. It is dedicated to His Royal Highness the Duke of York and is the *Ninth Edition,* considerably enlarged.

The printing of the volume was accomplished by Wood and Innes, Poppin's Court, Fleet Street, for J. Johnson, St. Paul's Churchyard; and Longman, Hurst, Rees and Orme, Paternoster Row.

The date of the publication was 1809. On page 95 of the history Smith states, "He (White) never published any book under the designation 'White's Farriery,' though this title is frequently quoted in contemporary works." Since the title "White's Farriery" appeared on the outside of my volume, printed during White's life, it is reasonable to assume that the author knew and approved of it, and that it was his own abbreviated title for the book.

Smith, on page 97, quotes an issue of Vol. I with the title: "A Treatise on Veterinary Medicine," etc., 8th Edition, London, 1807. He then states: "There is nothing further from his pen until 1812 when he published" . . . another edition of Vol. I under the same title which . . . "he has the audacity to call the tenth edition." It would appear that Smith did not know of the publication of the ninth edition in 1809, and that White was correct in calling his edition of 1812 the tenth.

Another interesting point is that it is possible that the volume was issued wholly or in parts unbound, for at the end is a note giving directions (to the bookbinder, presumably) as to the placing of the plates. Further, there are five

unprinted leaves at the end of the book of different paper to that containing the print. One of these carries a watermark, Britannia, surmounted by a crown, and another, Heale Mills 1816. All of these extra pages have also watermark lines at one-inch intervals. It is unlikely that a volume issued in a bound state in 1809 would require rebinding as early as 1816. The mystery is considerably deepened by the fact that the cover is signed on the inside of the book by its first owner, an officer of the Seventh Dragoon Guards, and is dated 1812.

Yours faithfully,

CHAS. R. TURBET, B.V.Sc., M.R.C.V.S.

Department of Agriculture,
Suva, Fiji.
July 24, 1942.

Review

The Mating of Thoroughbred Horses: Some Conclusions and Deductions. By H. E. KEYLOCK, F.R.C.V.S. Published by The British Bloodstock Agency, Ltd., 26, Charing Cross Road, London, W.C.2. June, 1942. Price £1 5s., plus postage 6d.

IT has been said that "When once one has been introduced to the study of pedigrees, and especially those appertaining to the thoroughbred, one becomes an addict for life." To some it becomes a business, to others an all-entrancing hobby. Many of its devotees have never been on a racecourse or been in material contact with the subjects of their study. This cannot be said of Major Keylock, for he is evidently a man who has enjoyed his subject both in theory and in practice. The science of breeding, and breeding to type and purpose has intrigued owners and geneticists for many generations. The practical exponents of the art have followed many ideas, but basically it has been founded on the theme: "Good will beget good." This has been proved to be correct in innumerable instances, but in just as many instances it has been proved to be in error. One has only to study the history of some full brothers and sisters to amplify this point. If there is a natural law or rule by which we can elucidate the problems associated with the inheritance of conformation performance or other character, the thoroughbred offers a wonderful field to the research worker, for here we have exact information which has been tabulated over many generations.

Major Keylock is no new adventurer in the field. He has applied a trained mind to the task in hand and produced a book that is at once arresting and interesting. If there is a fault in the book it is that it is such a mass of statistics that the average reader will have difficulty in keeping all the information in mind as he peruses the interesting pages.

Obituary

JOHN CHARLES COLEMAN died at the Victorial Hospital, Swindon, on Thursday, September 3, 1942, after a long illness. He was 80 years of age, and, having qualified at the London College on July 7, 1885, he had been a M.R.C.V.S. for 57 years.

He was born at Pewsey, Wiltshire, on March 3, 1863. He was educated at Marlborough Grammar School. He practised first at Chippenham, but in 1893 transferred to Swindon. In this town he built up a large practice and was so well known and respected that "John Coleman, Swindon," was all the address required by any correspondent. He was a man of undoubted professional ability and of a strong, forceful character; one who knew his own mind and was never afraid to express his opinions. These opinions often brought him into conflict with his professional brethren, including those of highest rank. Such was his strong character that he was never a "quitter" and would fight to the bitter end. His memorable contest with Sir John Macfadyean and, later, with certain members of the Council of the R.C.V.S., were typical of the man. It is sad to relate that the effect of the latter was to deny him the highest office in his profession. His many friends were sorry, for he had worked faithfully on the Council for a period of 24 years. If he had disappointment he never showed it, he just went bravely on his way, still convinced of the justice of his cause, as indeed were many within the profession, and there is not much doubt that if he had not been handicapped by age and ill-health this remarkable man would have risen again. It is a strange commentary on the foibles of public opinion that the thing for which he fought and suffered, i.e., a system of postgraduate instruction in specialist technique, has become a recognised commonplace event in Veterinary circles. John Coleman was always a handsome man with a strong face, but as he grew old a mantle of great dignity seemed to surround him. His silver hair and great head made him a mark in any company. He could express his views in a forceful yet cultured manner and could always command an audience. For many years he was one of the pillars of the Mid-West Society and was a frequent attender at the meetings of the Central. He would air his views with great vigour and sincerity, no matter even if his party consisted only of one. His opposition to ladies being present at the annual dinner of the Central was against the popular oipnion, yet never for one moment did he bend or bow to that opinion. John Coleman has gone, but he leaves an imperishable memory in the minds of those who knew him—of a man afraid of no one, one who tried to do his best for his profession and one with whom you could have terrific differences of opinion and yet friendship would not be impaired.

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